

Report No	EE0056-4
Client	Voxware, Inc. 185 Alewife Brook Parkway Cambridge, MA 02138
Phone	617-497-0200
Fax	617-576-2123
FRN	0010250033
Model	VLS-410 w/ 500mW Symbol card
FCC ID	SC6VLS410S245
Equipment Type	Spread Spectrum Transmitter
Equipment Code	DSS
Results	As detailed within this report
Prepared by	 Evan Gould – Test Engineer
Authorized by	 Michael Buchholz – EMC Manager
Issue Date	
Conditions of issue	This Test Report is issued subject to the conditions stated in ‘terms and conditions’ section of this report.

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Summary

This test report supports an application for certification of a transmitter operating pursuant to 47 CFR 15.247. The product is the Voxware VLS-410 with the Symbol LA-3021-500-US card. It is a frequency hopper that operates in the range 2400-2483.5MHz. It utilizes a hopping table of 79 channels. The LA-3021-500-US card has previously been certified as FCC ID H9PLA3021-500. The purpose of this application is to certify the VLS-410 which utilizes this radio with a new antenna (Proxim 7742 0dBi omnidirectional antenna) in a body worn configuration.

Test Methodology

Radiated emissions testing is performed according to the procedures specified in ANSI C63.4 (2003). Public Notice DA 00-705 *"Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems"* was followed for testing as well. Emissions were maximized by rotating the EUT (including external antenna) around three orthogonal axes as well as varying the test antenna's height and polarity. The external antenna can not be maximized separately. Fresh batteries were used throughout testing.

Frequency range investigated: 30MHz – 26.5GHz

Measurement distance:	30 - 1000MHz	3m
	1 – 26.5GHz	1m

Statement of Conformity

The VLS-410 has been found to conform with the following parts of 47 CFR as detailed below:

Part 2	Part 15	Comments
	15.15(b)	There are no controls on this device that adjust the power level.
2.925	15.19	The label is shown in the label exhibit.
	15.21	Information to the user is shown in the instruction manual exhibit.
	15.27	No special accessories are required for compliance.
	15.203	The external antenna connector is a unique connector type: reverse MCX.
	15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209.
	15.207	The unit is battery powered.
	15.247	The unit complies with the frequency hopper requirements of 15.247

EUT Configuration

EUT Configuration			
Work Order: E0056			
Company: Voxware, Inc.			
Company Address: 185 Alewife Brook Parkway Cambridge, MA 02138			
Contact: Fred Earthrowl			
Person Present: Fred Earthrowl			
MN	SN	FCC ID	
EUT:			
Hopping sample VLS410	5979-0210		
Non-hopping sample VLS410	59790349		
100mW Symbol Tx/Rx card: LA-3021-500-US	-	H9PLA3021-500	
Antenna type: Proxim 7742 0dBi omnidirectional antenna			
EUT Max Frequency: 2.483GHz			
Support Equipment:	MN	SN	FCC ID
Head set	1108-XXQDS	03061031	-
Metrologic Scanner	IS4220	1603390165	-
EUT Cables:	Qty	Shielded?	Length
Head set cable	1	No	4 feet
Scanner cable	1	Yes	5 feet
Unpopulated EUT Ports:	Qty	Reason	
None			
Software / Operating Mode Description:			
Conducted Measurements: Running diagnostic software in order to set the frequency, modulation, data sequence, etc.			
Radiated Measurements: continuously transmitting or receiving a file to/from a support laptop.			

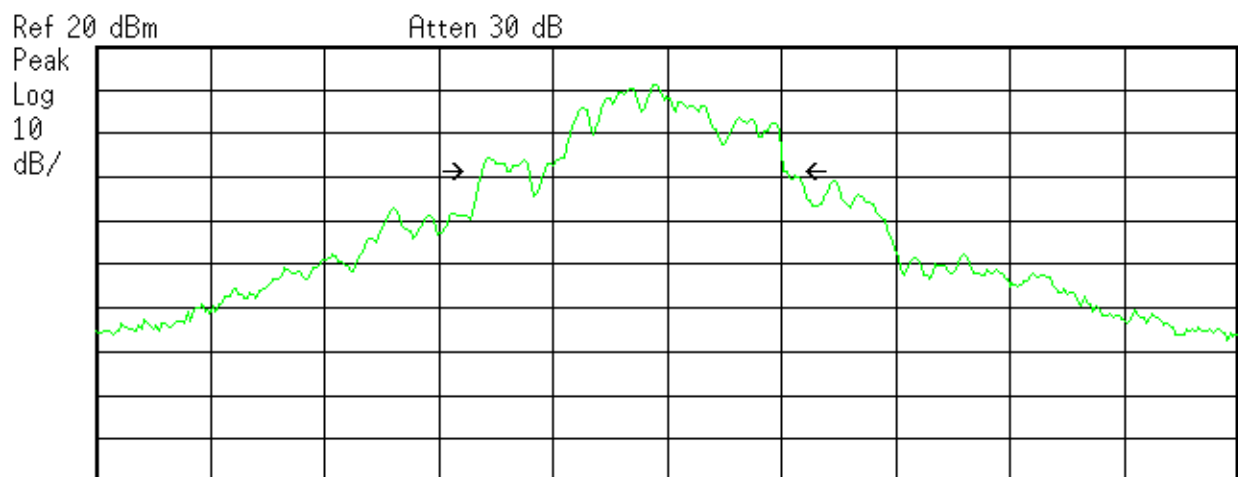
20dB Bandwidth**MEASUREMENT**

The 20dB bandwidths were measured for frequencies 2402, 2440, and 2480MHz. The maximum 20dB bandwidth measured was **979kHz**. This value was used as the limit for the channel separation requirement.

ANALYZER PLOTS**2402MHz 20dB Bandwidth**

Agilent 16:38:38 Sep 10, 2004

R L



Center 2.402 GHz

Span 3 MHz

#Res BW 30 kHz

#VBW 300 kHz

Sweep 9.167 ms (401 pts)

Emission Bandwidth Results (paused)

Emission Bandwidth

Emiss BW X dB -20.0 dB

798.5 kHz

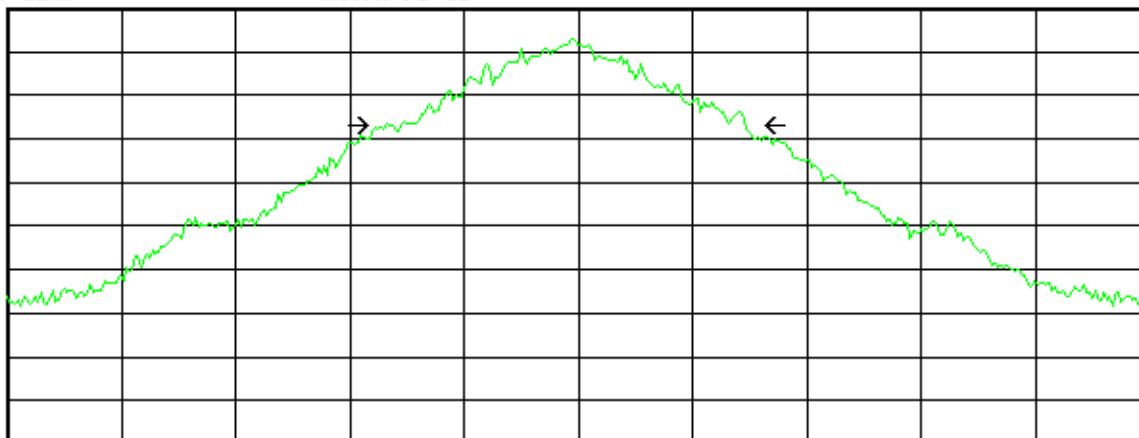
2440MHz 20dB Bandwidth

* Agilent 17:04:49 Sep 10, 2004

R L

Ref 24 dBm

Atten 35 dB

Peak
Log
10
dB/

Center 2.44 GHz

Span 3 MHz

#Res BW 30 kHz

#VBW 300 kHz

Sweep 9.167 ms (401 pts)

Emission Bandwidth Results (paused)

Emission Bandwidth

Emiss BW X dB -20.0 dB

946.6 kHz

2480MHz 20dB Bandwidth

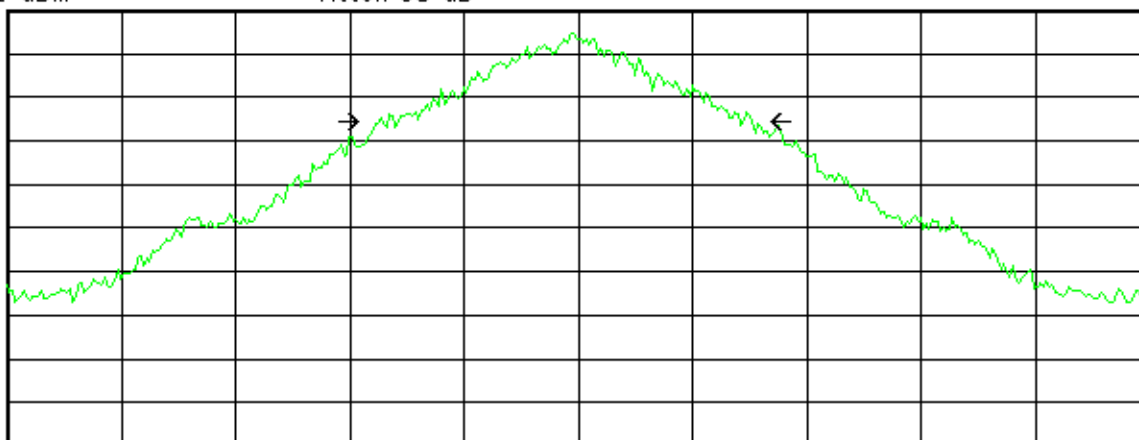
Agilent 17:16:16 Sep 10, 2004

R L

Ref 21 dBm

Atten 35 dB

Peak
Log
10
dB/



Center 2.48 GHz

Span 3 MHz

#Res BW 30 kHz

#VBW 300 kHz

Sweep 9.167 ms (401 pts)

Emission Bandwidth Results (paused)

Emission Bandwidth
979.4 kHz

Emiss BW X dB -20.0 dB

Channel Separation

REQUIREMENT

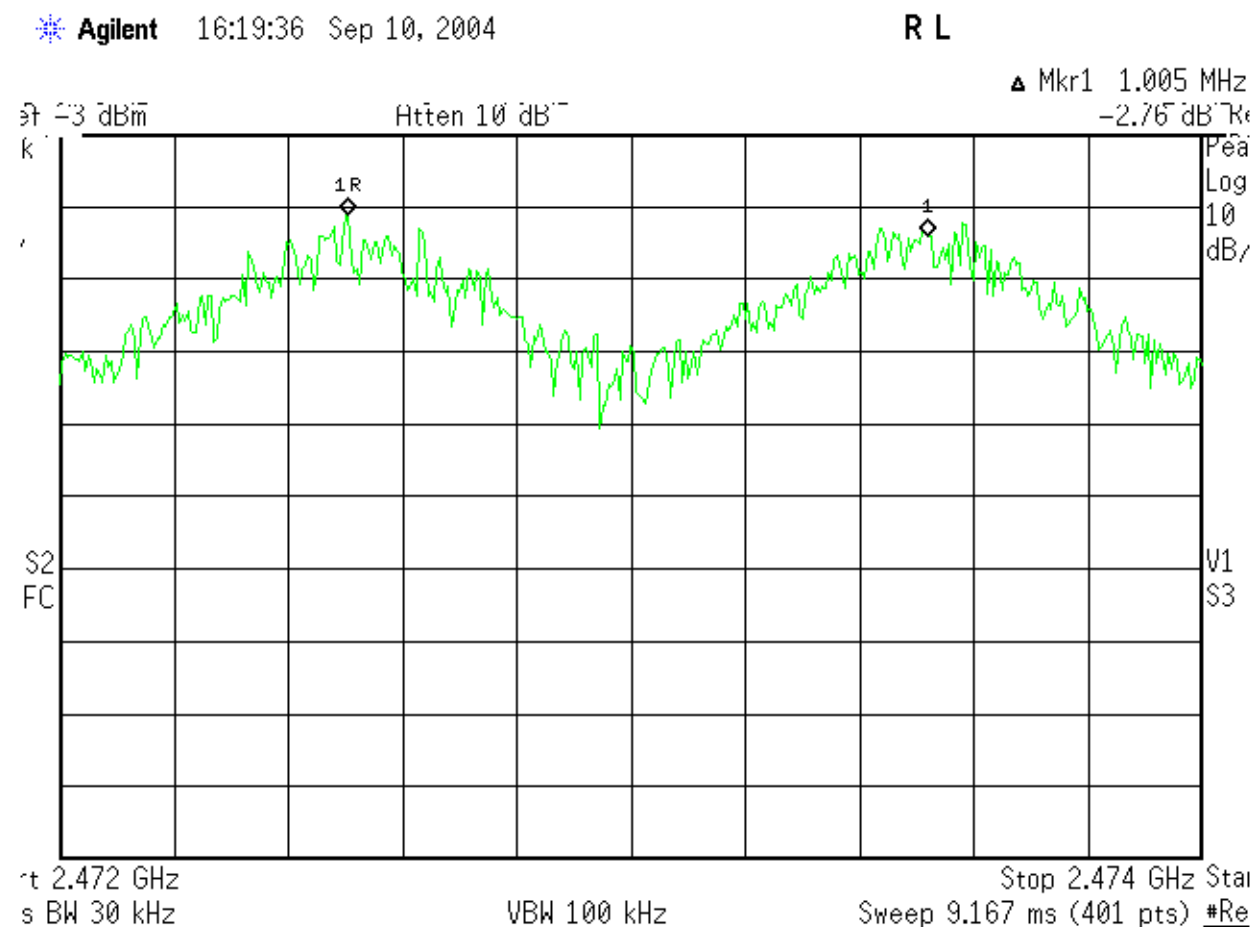
"Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater." [15.247(a)(1)]

20dB bandwidth = 979kHz (see "20dB Bandwidth" section)

MEASUREMENT

Channel separation = 1MHz

ANALYZER PLOT



Number of Hopping Frequencies

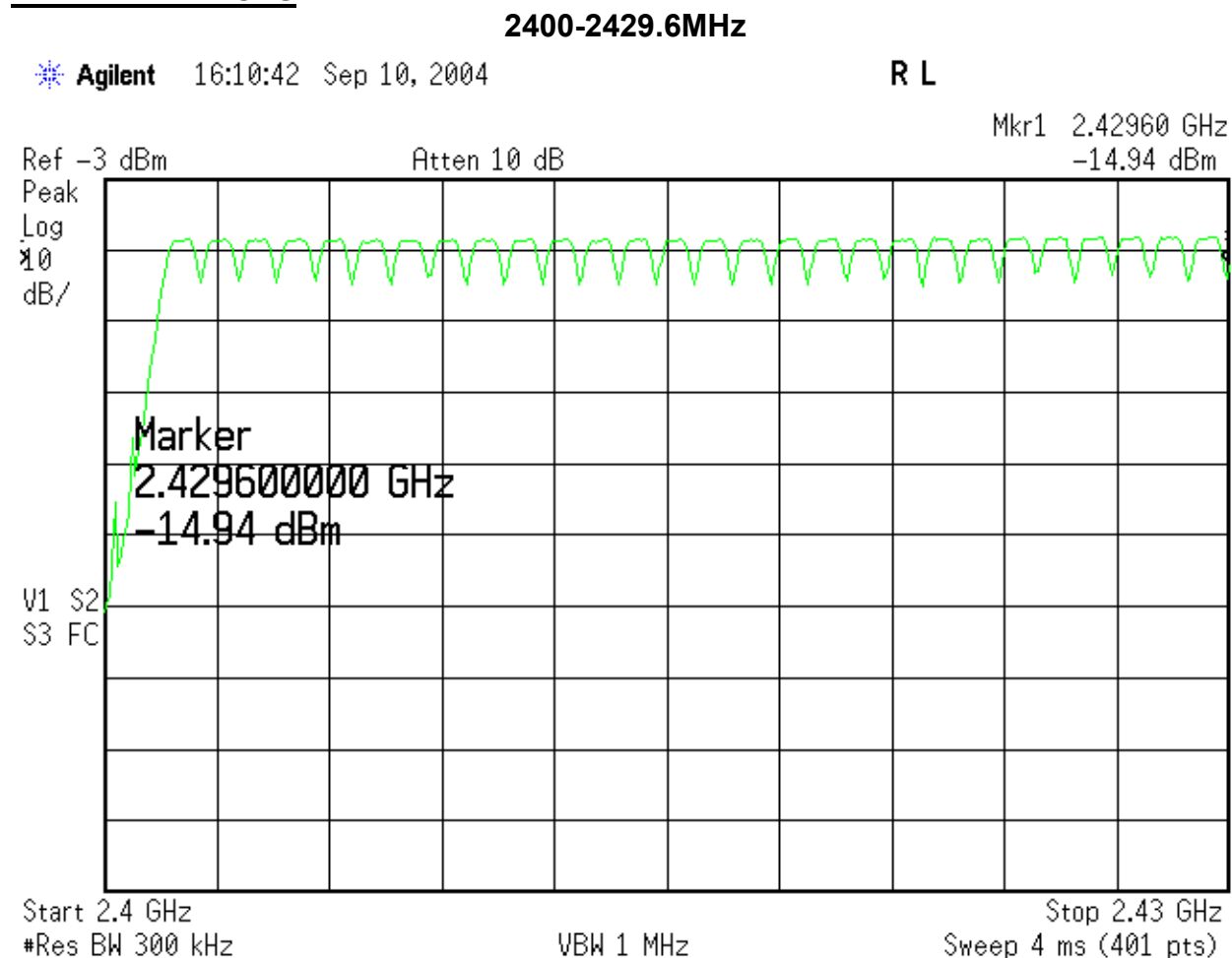
REQUIREMENT

"Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels." [15.247(a)(1)(iii)]

MEASUREMENT

79 hopping frequencies can be counted in the following three analyzer plots.

ANALYZER PLOTS

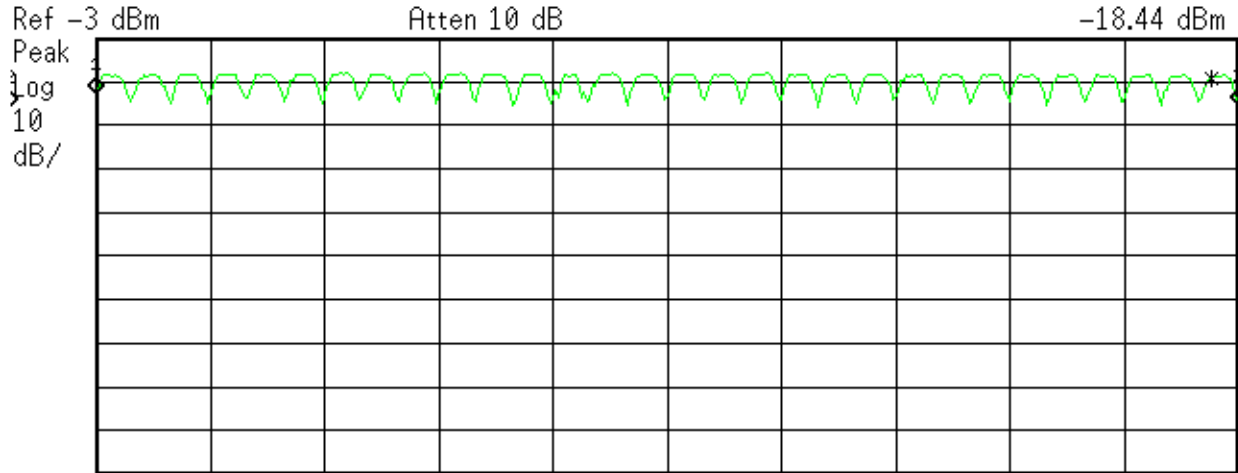


2429.6-2459.5MHz

* Agilent 16:13:22 Sep 10, 2004

R L

Mkr2 2.45954 GHz
-18.44 dBm



Start 2.43 GHz Stop 2.46 GHz
#Res BW 300 kHz VBW 1 MHz Sweep 4 ms (401 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.42960 GHz	-15.93 dBm
2	(1)	Freq	2.45954 GHz	-18.44 dBm

2459.5-2483.5MHz

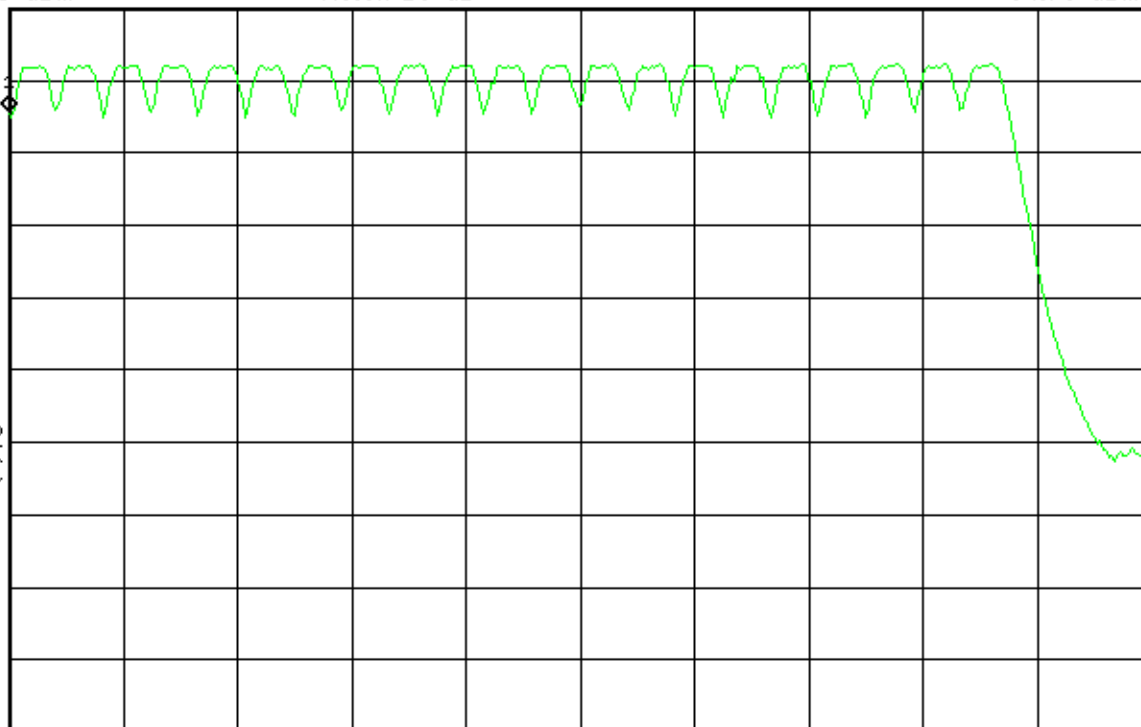
* Agilent 16:16:54 Sep 10, 2004

R L

Mkr2 2.48350 GHz
-64.76 dBm

Ref -3 dBm

Atten 10 dB

Peak
Log
10
dB/y1 S2
S3 FC

Start 2.46 GHz

Stop 2.483 GHz

#Res BW 300 kHz

VBW 1 MHz

Sweep 4 ms (401 pts)

Time of Occupancy (Dwell Time)

REQUIREMENT

"The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed"
[15.247(a)(1)(iii)]

MEASUREMENTS

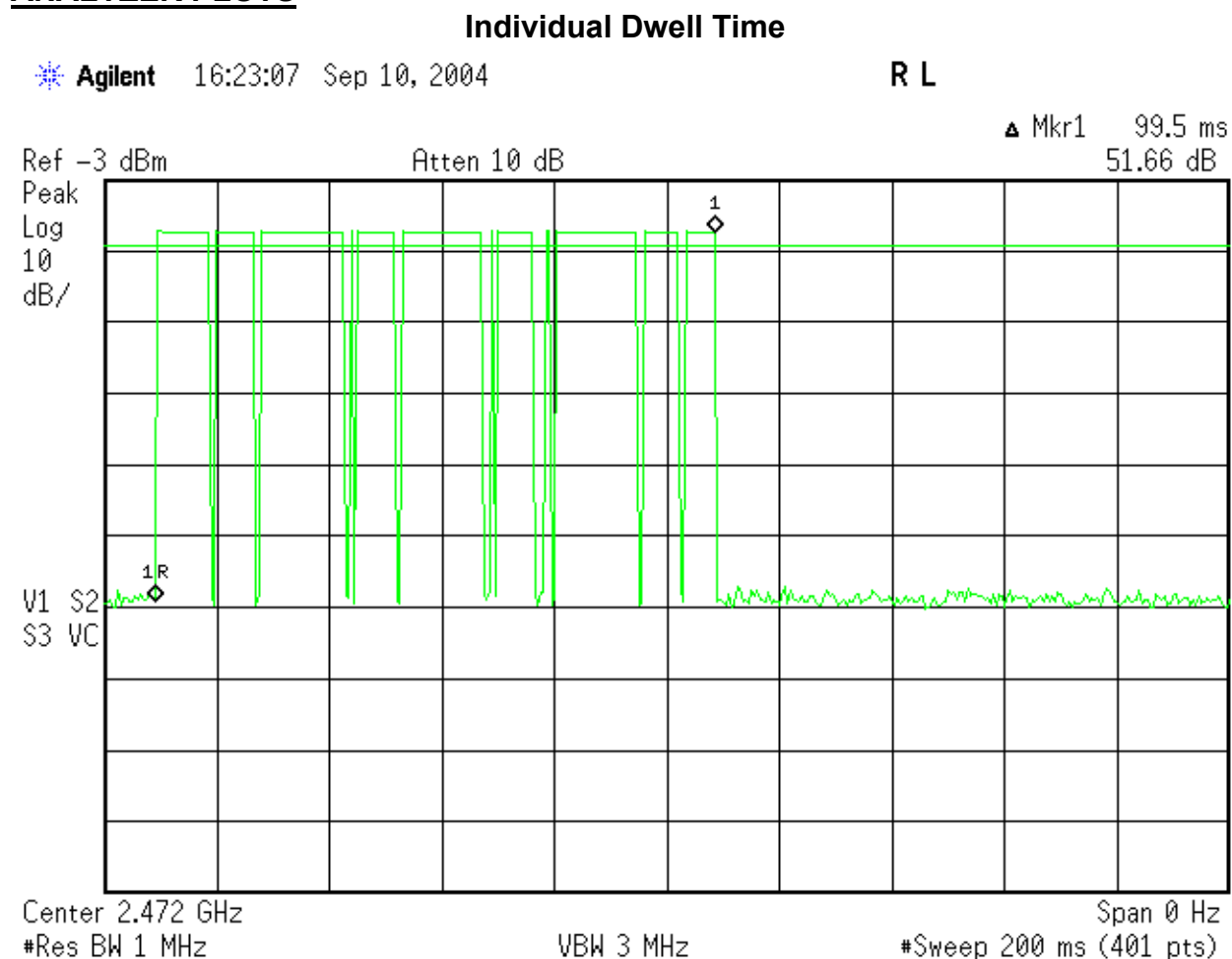
Individual dwell time: 0.1s

Time to return to the same channel: 8.1s (see second plot below)

Number of dwells within 31.6s ($0.4s \times 79$): $31.6/8.1 \leq 4$

Worst case dwell time within 31.6s: $4 \times 0.1s = 0.4s$

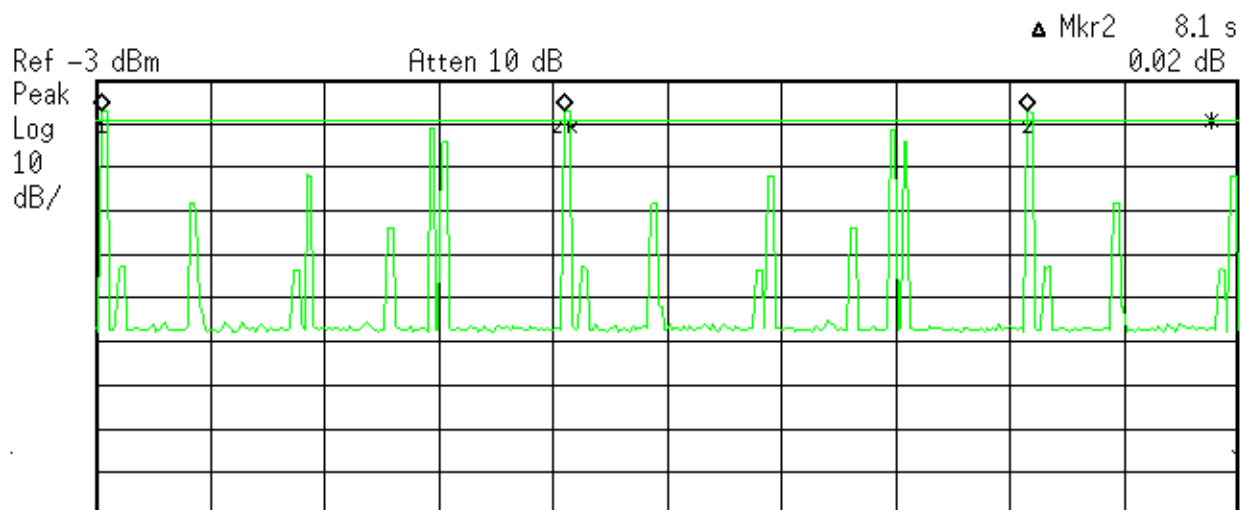
ANALYZER PLOTS



20s Window

* Agilent 16:28:53 Sep 10, 2004

R L



Center 2.472 GHz

Span 0 Hz

#Res BW 1 MHz

VBW 3 MHz

#Sweep 20 s (401 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Time	100 ms	-10.14 dBm
2R	(1)	Time	8.2 s	-10.14 dBm
2Δ	(1)	Time	8.1 s	0.02 dB

Peak Output Power

LIMIT

"The maximum peak output power of...systems in the 2400-2483.5 MHz band employing at least 75 hopping channels...: 1 Watt." [15.247(b)(1)]

Since the maximum directional gain of the antenna is less than 6dBi, there is no corresponding reduction in the peak output power limit. [15.247(b)(4)]

MEASUREMENTS

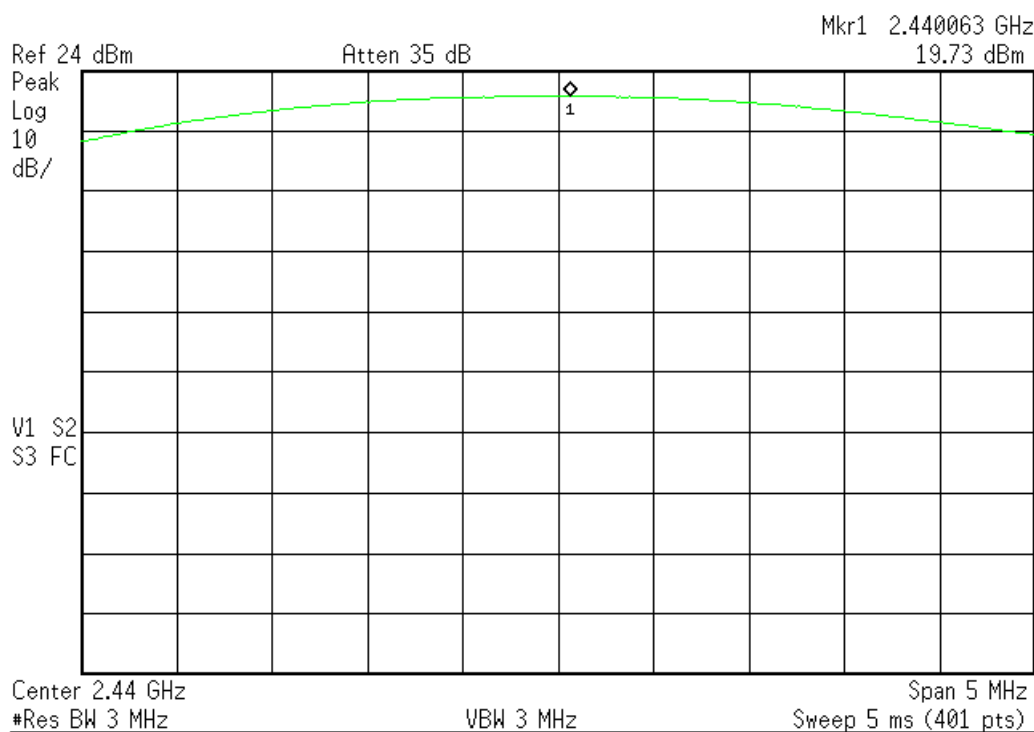
Peak Output Power						Curtis-Straus LLC		
Date: 10-Sep-04			Engineer: Evan Gould			Work Order: E0056		
Company: Voxware			EUT: VLS-410			Fundamental Frequencies: 2400-2483.5MHz		
Test Site: "T"						Cable: Microflex #8		
Attenuator: N/A						Analyzer: Orange		
Measurement: Max Hold						Resolution BW: 3MHz		
Detector Type: Peak						Video BW: 3MHz		
Notes:								
Channel	Frequency (MHz)	Reading (dBm)	Cable Factor (dB)	Attenuator Factor (dB)	Adjusted Reading (dBm)	47 CFR 15.247(b)(1)		
						Limit (dBm)	Margin (dB)	Result (Pass/Fail)
low	2402	18.2	1.0	0	19.2	30.0	-10.8	Pass
mid	2440	19.7	1.0	0	20.7	30.0	-9.3	Pass
high	2480	18.8	1.0	0	19.8	30.0	-10.2	Pass

SAMPLE ANALYZER PLOT

2402MHz Peak Output Power

Agilent 17:07:09 Sep 10, 2004

R L



Conducted Spurious Emissions

LIMIT

Peak: 20dB down from fundamental [15.247(c)]

MEASUREMENTS

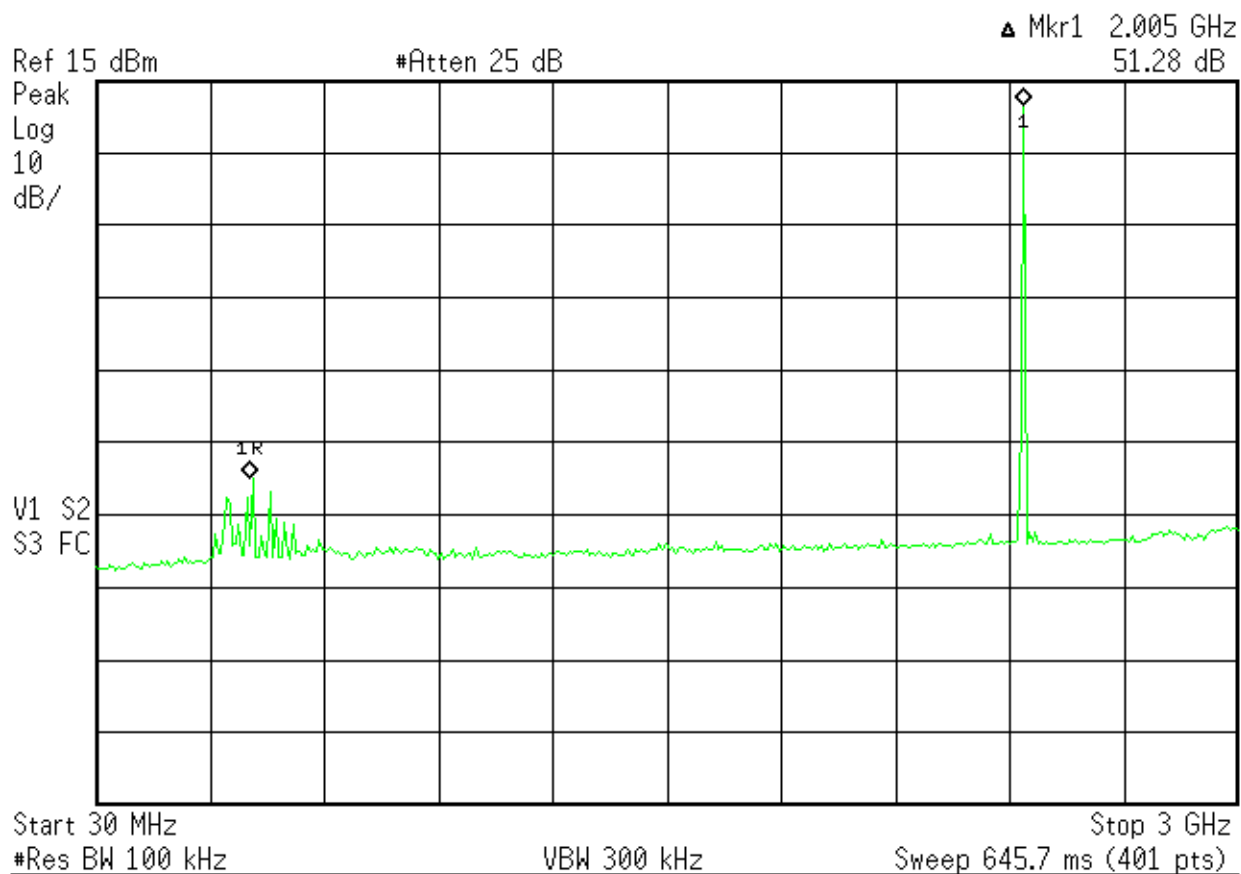
No failing conducted spurious emissions were detected. See the plots below.

ANALYZER PLOT

30MHz – 3GHz

Agilent 15:40:49 Sep 10, 2004

R L



2GHz – 26.5GHz

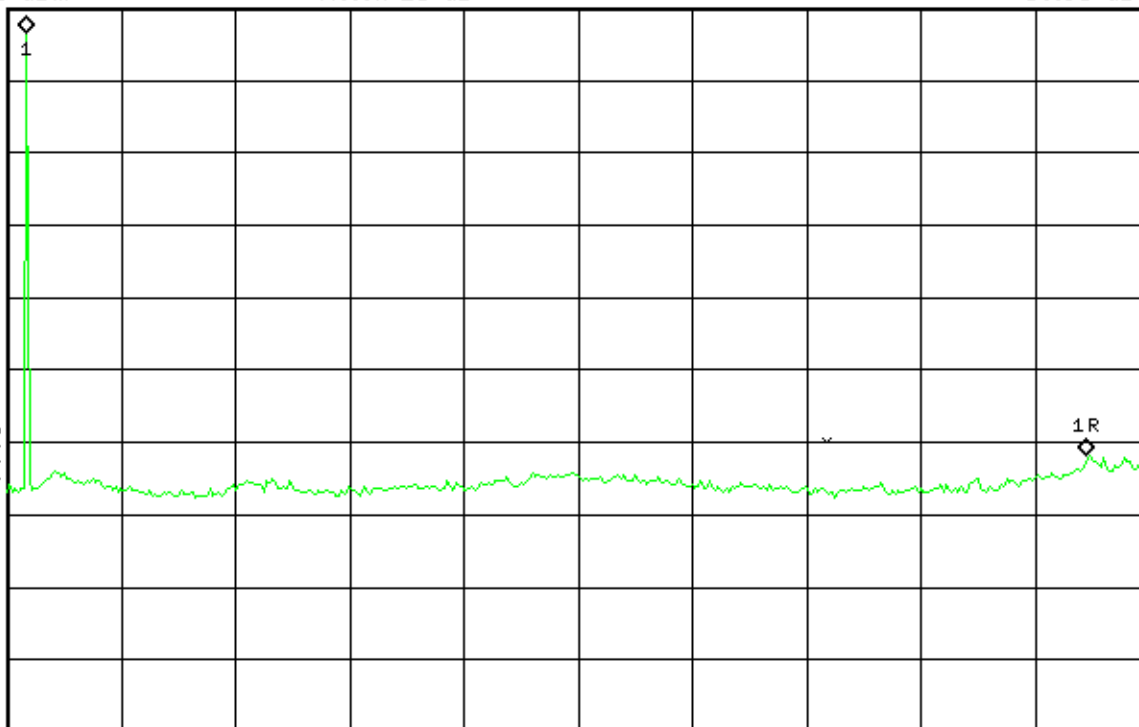
* Agilent 15:42:58 Sep 10, 2004

R L

▲ Mkr1 -22.79 GHz
58.35 dB

Ref 15 dBm

#Atten 25 dB

Peak
Log
10
dB/V1 S2
S3 FC

Start 2 GHz

Stop 26.5 GHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 5.326 s (401 pts)

Conducted Band Edges

LIMITS

Peak: 20dB down from fundamental [15.247(c)]

RESULTS

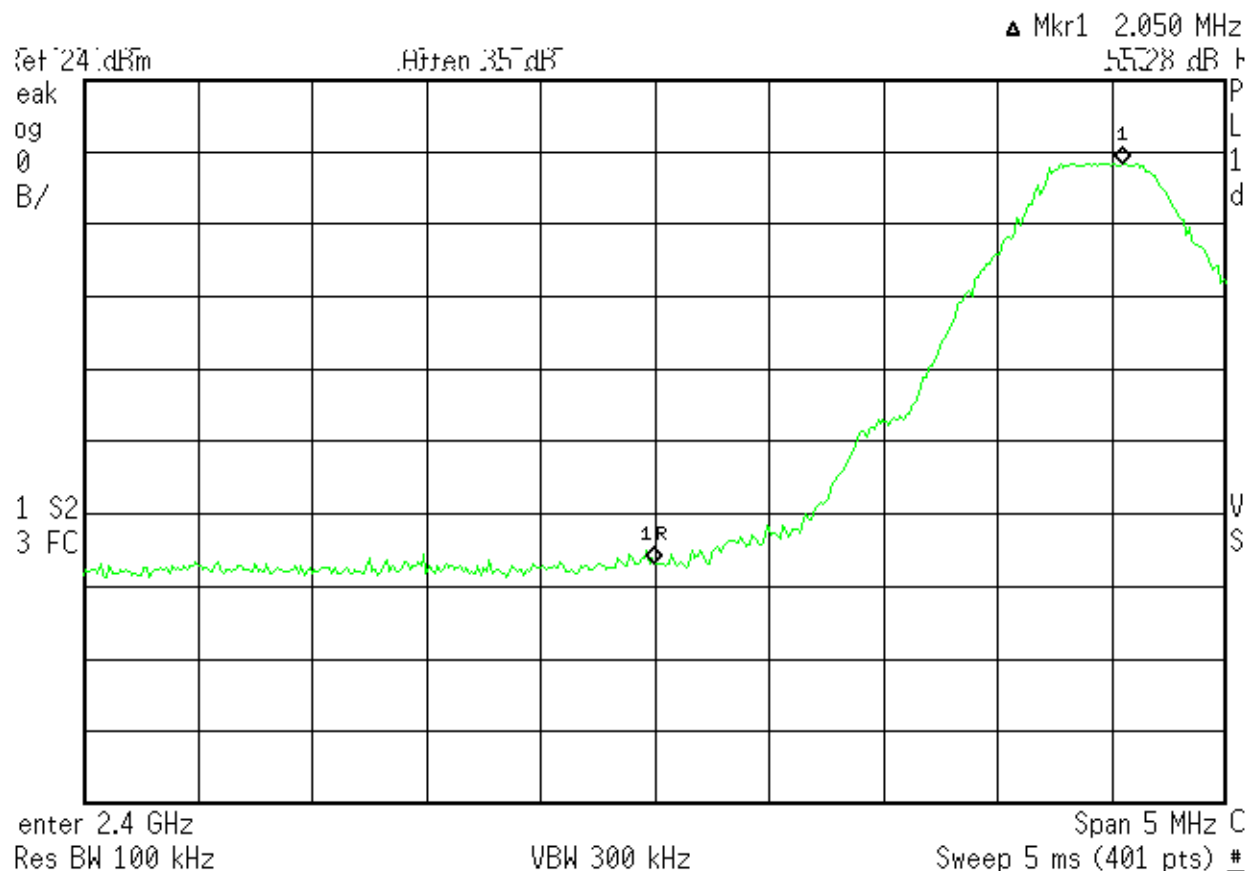
It can easily be seen in the plots shown below that the conducted band edges are at least 20dB down from the peak of the fundamental.

ANALYZER PLOT

Low Band Edge – Hopping Disabled

Agilent 15:25:09 Sep 10, 2004

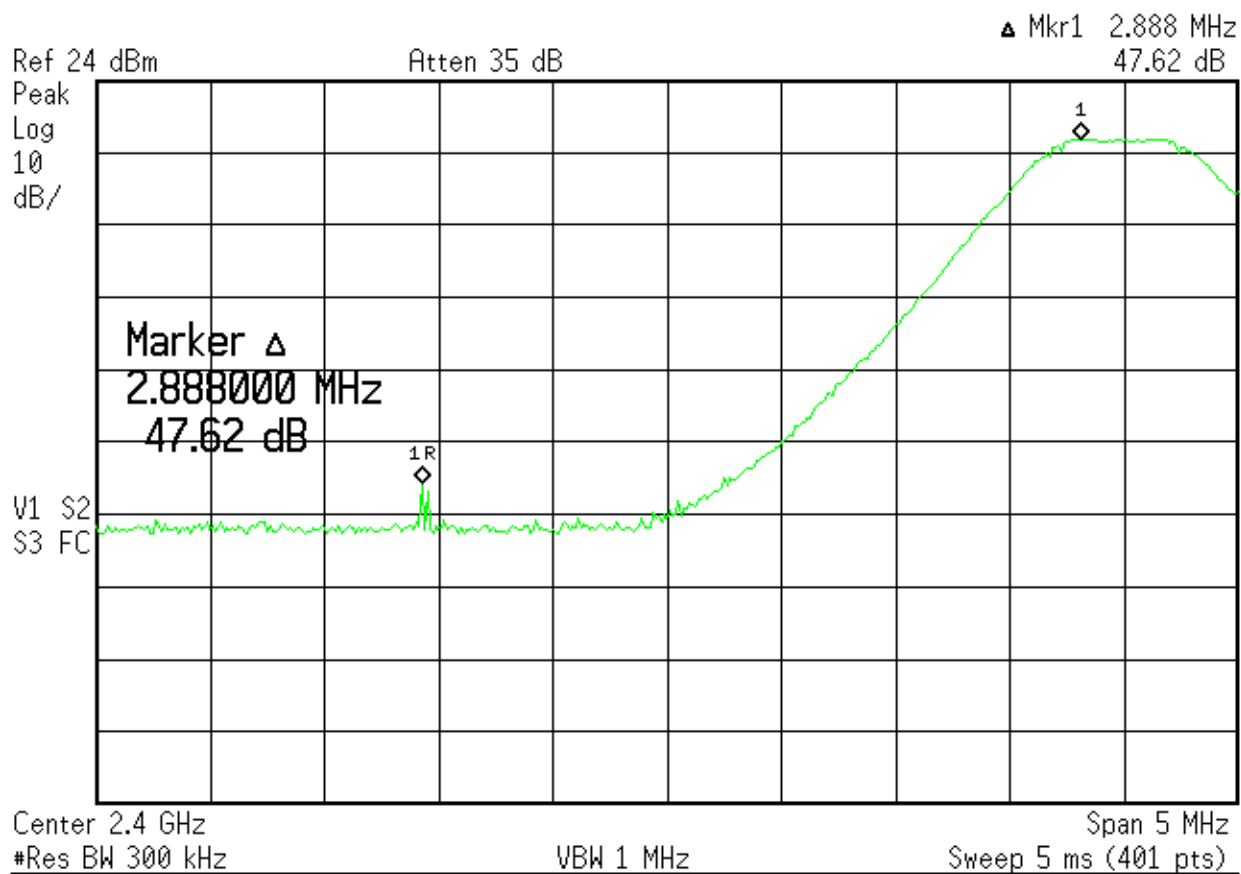
R L



Low Band Edge – Hopping Enabled

* Agilent 15:10:03 Sep 10, 2004

R L



High Band Edge – Hopping Disabled

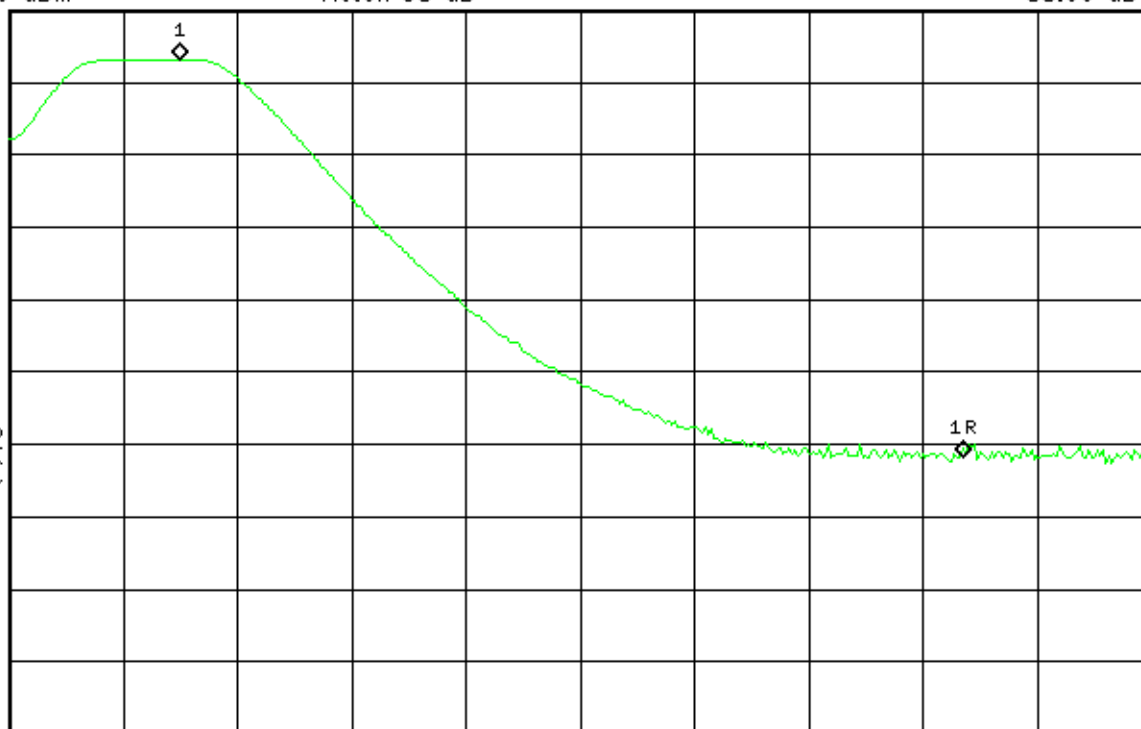
* Agilent 15:55:46 Sep 10, 2004

R L

▲ Mkr1 -3.425 MHz
55.09 dB

Ref 20 dBm

#Atten 35 dB

Peak
Log
10
dB/V1 S2
S3 FC

Center 2.482 GHz

Span 5 MHz

#Res BW 300 kHz

VBW 1 MHz

Sweep 5 ms (401 pts)

High Band Edge – Hopping Enabled

* Agilent 15:06:24 Sep 10, 2004

R L

▲ Mkr1 -3.375 MHz
52.93 dB

Ref 24 dBm

Atten 35 dB

Peak
Log
10
dB/Marker ▲
-3.375000 MHz
52.93 dBV1 S2
S3 FC

Center 2.482 GHz

#Res BW 300 kHz

VBW 1 MHz

Span 5 MHz

Sweep 5 ms (401 pts)

Radiated Band Edge

LIMIT

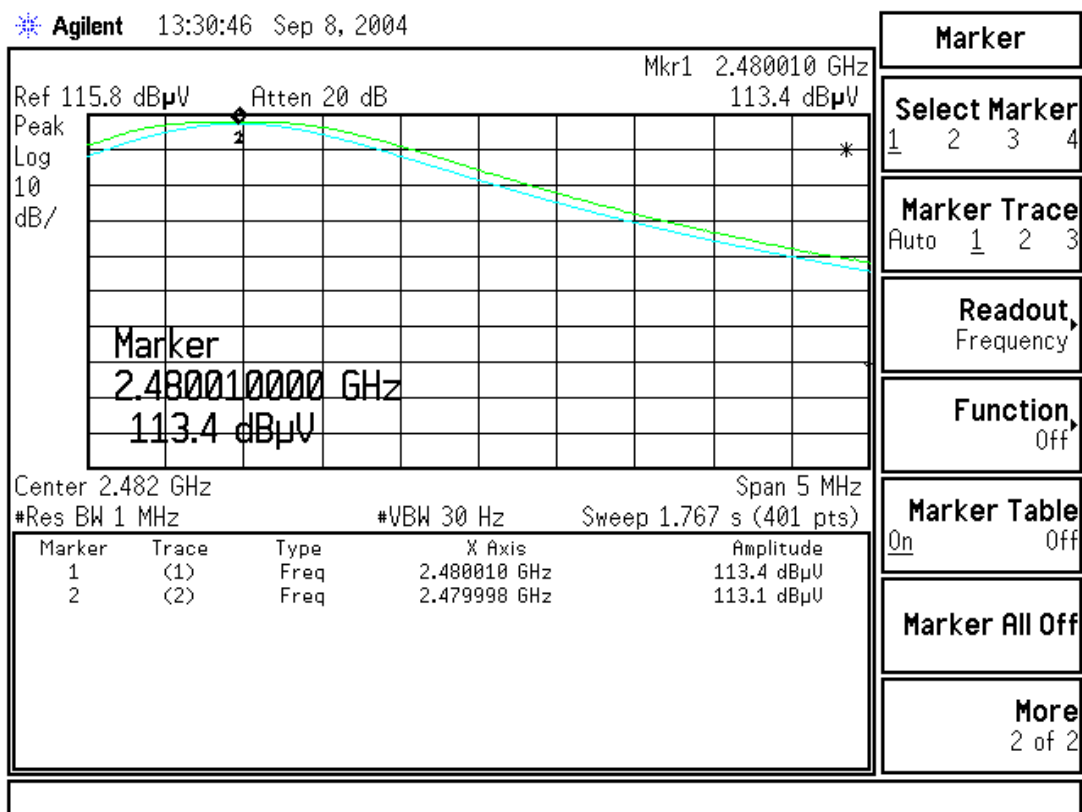
"...radiated emissions which fall in the restricted bands, as defined in §15.209(a), must also comply with the radiated emission limits specified in §15.209(a)" [15.247(c)]

MEASUREMENTS

Radiated Band Edge (Restricted Band)							Curtis-Straus LLC		
Date: 08-Sep-04			Company: Voxware				Work Order: E0056		
Engineer: Evan Gould			EUT Desc: VLS-410 w/ Symbol card						
Frequency Range: 2483.5MHz					Measurement Distance: 1 m				
Detector: Peak						RBW: 1MHz			
Notes: the marker-delta method was used for these measurements						VBW: 3MHz (10Hz for average)			
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)	47 CFR 15.209		
							Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
Hpk	2483.5	44.2	18.4	29.8	2.0	57.6	83.5	-25.9	Pass
Hav	2483.5	43.9	18.4	29.8	2.0	57.3	63.5	-6.2	Pass
Table Result:		Pass	by		-6.2 dB		Worst Freq:		2483.5 MHz
Test Site: "T"		Pre-Amp: White		Cable: 6 RG142LL		Analyzer: Orange		Antenna: Orange Horn	

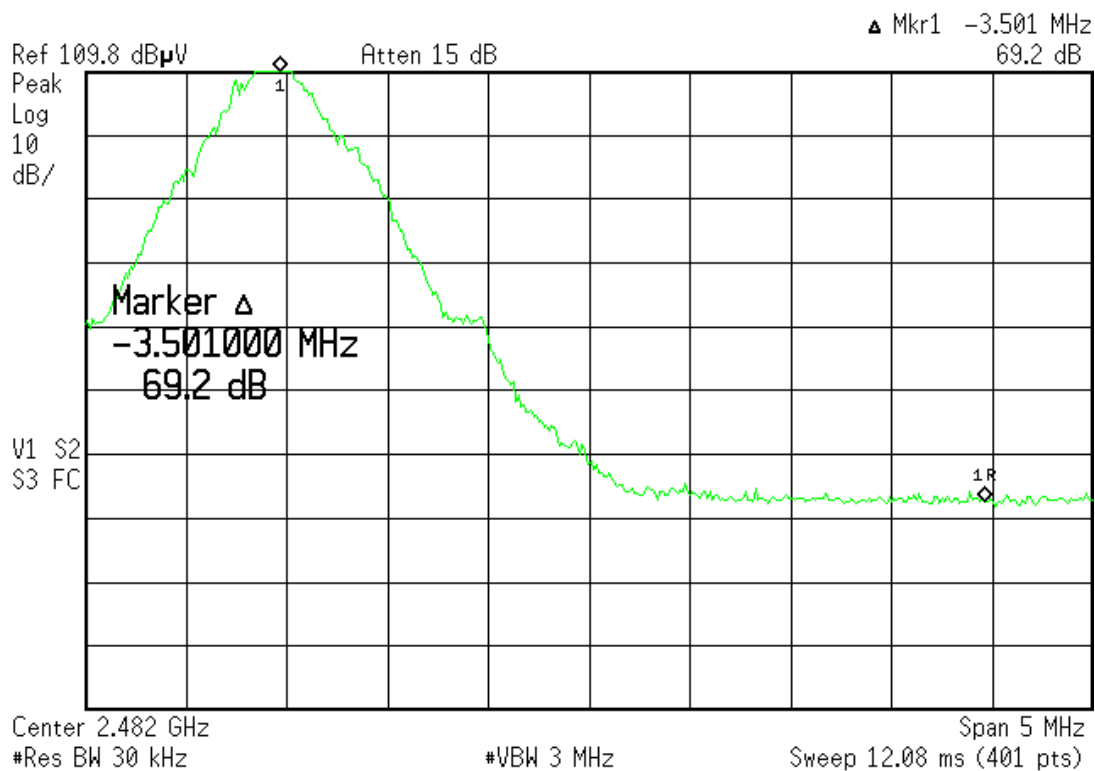
ANALYZER PLOTS

Peak Values



Marker-Delta

* Agilent 13:37:47 Sep 8, 2004



Radiated Spurious Emissions

LIMITS

"...radiated emissions which fall in the restricted bands, as defined in §15.209(a), must also comply with the radiated emission limits specified in §15.209(a)" [15.247(c)]

MEASUREMENTS

Radiated Emissions Table							Curtis-Straus LLC		
Date: 09-Sep-04 9/17/2004			Company: Voxware				Work Order: E0056		
Engineer: Evan Gould			EUT Desc: VLS-410 w/ 500mW Symbol card						
Frequency Range: 30-1000MHz						Measurement Distance: 3 m			
Notes: hopping is enabled						RBW: 120kHz			
EUT is transmitting and receiving						VBW: 300kHz			
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)	47 CFR 15.209		
							Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
Vbb	129.0	37.3	22.2	8.0	1.5	24.6	43.5	-18.9	Pass
Vbb	145.1	36.7	22.3	10.3	1.6	26.3	43.5	-17.2	Pass
V	165.9	50.6	22.2	9.4	1.7	39.5	43.5	-4.0	Pass
Hopping Disabled									
transmitting on 2402MHz			---	---	---	---	---	---	---
V	169.0	46.6	22.3	10.1	1.7	36.1	43.5	-7.4	Pass
transmitting on 2440MHz			---	---	---	---	---	---	---
V	169.0	46.8	22.3	10.1	1.7	36.3	43.5	-7.2	Pass
transmitting on 2480MHz			---	---	---	---	---	---	---
V	169.0	46.0	22.3	10.1	1.7	35.5	43.5	-8.0	Pass
Table Result:		Pass	by	-4.0 dB			Worst Freq:		165.9 MHz
Test Site: "T"		Pre-Amp: Black		Cable: 65 ft RG8A/U		Analyzer: Yellow		Antenna: Blue	
Test Site: "A"		Pre-Amp: Blue		Cable: 66 ft RG8A/U		Analyzer: Green		Antenna: Blue-Wht	

Note: No radiated spurious emissions were detected in the range 1 – 26.5GHz.

Test Equipment Used

REV. 17-SEP-2004

SPECTRUM ANALYZERS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	9kHz-1.8GHz	8591E	HP	3441A03559	00024	26-MAY-2005
WHITE	9kHz-22GHz	8593E	HP	3547U01252	00022	04-MAR-2005
BLUE	9kHz-1.8GHz	8591E	HP	3223A00227	00070	30-SEP-2004
YELLOW	9kHz-2.9GHz	8594E	HP	3523A01958	00100	11-AUG-2005
GREEN	9kHz-26.5GHz	8593E	HP	3829A03618	00143	02-AUG-2005
BLACK	9kHz-12.8GHz	8596E	HP	3710A00944	00337	18-AUG-2005
YELLOW-BLACK	20Hz-40.0MHz	3585A	HP	2504A05219	00030	02-DEC-2004
ORANGE	9kHz-26.5GHz	E4407B	HP	US39440975	00394	03-JUN-2005

OPEN AREA TEST SITE (OATS)	FCC CODE	IC CODE	VCCI CODE	CALIBRATION DUE
SITE F	93448	IC 2762-F	R-1688	25-MAR-2005
SITE T	93448	IC 2762-T	R-905	25-MAR-2005
SITE A	93448	IC 2762-A	R-903	25-MAR-2005
SITE M	93448	IC 2762-M	R-904	25-MAR-2005
BUBBLE (HP FACILITY)	N/A	N/A	R-1467	16-MAY-2005

PREAMPS / ATTENUATORS / FILTERS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	0.10-2000MHz	ZFL-1000-LN	C-S	N/A	00798	31-MAR-2005
BLUE	0.01-2000MHz	ZFL-1000-LN	C-S	N/A	00759	26-JUL-2005
BLUE-BLACK	0.01-2000MHz	ZFL-1000-LN	C-S	N/A	00800	31-MAR-2005
GREEN	0.01-2000MHz	ZFL-1000-LN	C-S	N/A	00802	27-FEB-2005
BLACK	0.01-2000MHz	ZFL-1000-LN	C-S	N/A	00799	27-FEB-2005
ORANGE	0.01-2000MHz	ZFL-1000-LN	C-S	N/A	00765	27-FEB-2005
WHITE	1-20GHz	SMC-12A	C-S	426643	00760	21-JUL-2005
YELLOW-BLACK	1-20GHz	SMC-12A	C-S	535055	00801	21-JUL-2005
ORANGE-BLACK	1-20GHz	SMC-12A	C-S	637367	00761	21-JUL-2005
HF (YELLOW)	18-26.5GHz	AFS4-18002650-60-8P-4	C-S	467559	00758	20-JUL-2005
HIGH PASS FILTER	1-18 GHz	SPA-F-55204	K&L	36	00817	06-JAN-2006
LOW PASS FILTER	1-9 GHz	11SL10-4100/X4400-O/O	K&L	4	00816	06-JAN-2006
HF 20dB ATTENUATOR	0.03-20 GHz	PE 7019-20	PASTERNAK	01	00791	21-MAY-2005
LOW FREQ LPF	10-100kHz	L200K1G1	MICROWAVE CIRCUITS	4460-01 DC0432	1019	30-AUG-2005
LOW FREQ LPF	10-100kHz	L200K1G1	MICROWAVE CIRCUITS	4777-01 DC0434	1088	30-AUG-2005

ANTENNAS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
GREEN BILOG	30MHz-2GHz	CBL6112B	CHASE	2742	00620	06-APR-2006
GREEN-BLACK BILOG	30MHz-2GHz	CBL6112B	CHASE	2412	00127	06-JAN-2006
GREEN-RED BILOG	30MHz-2GHz	CBL6112B	CHASE	2435	00990	06-APR-2006
BLUE-WHITE BILOG	30MHz-2GHz	3142B	EMCO	1527	TELOGY RENTAL	03-AUG-2006
RED BILOG	30MHz-1GHz	3143	EMCO	1270	00042	17-MAR-2005
BLUE BILOG	30MHz-1GHz	3143	EMCO	1271	00803	17-MAR-2005
GRAY BILOG	26MHz-2GHz	3141	EMCO	9703-1038	00066	19-MAY-2005(EMI) / 21-JUN-2005(RFI)
YELLOW-BLACK BILOG	20-2000MHz	CBL6140A	CHASE	1112	00126	19-MAY-2005(EMI) / 25-JUN-2005(RFI)
YELLOW HORN	1-18GHz	3115	EMCO	9608-4898	00037	22-MAY-2005
BLACK HORN	1-18GHz	3115	EMCO	9703-5148	00056	12-JUN-2005
ORANGE HORN	1-18GHz	3115	EMCO	0004-6123	00390	04-JUN-2005
HF (WHITE) HORN	18-26.5GHz	801-WLM	WAVELIN E	00758	00758	15-JUL-2005

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Terms And Conditions

Paragraph 1. SERVICES. LABORATORY will:

- 1.1 Use the degree of care and skill ordinarily exercised by and consistent with the standards of the profession.
- 1.2 Perform all technical services in substantial accordance with the generally accepted laboratory principles and practices.
- 1.3 Retain all pertinent records relating to the services performed for a period of three (3) years following submission of the report describing such services, during which period the records will be made available to CLIENT upon reasonable request.

Paragraph 2. CLIENT'S RESPONSIBILITIES. CLIENT or his authorized representative will:

- 2.1 Provide LABORATORY with all plans, schematics, specifications, addenda, change orders, drawings and other information for the proper performance of technical services.
- 2.2 Designate a person to act as CLIENT's representative with respect to LABORATORY's services to be performed on behalf of the CLIENT; such person or firm to have complete authority to transmit instructions, receive information and data, interpret and define CLIENT's policies and decisions with respect to the LABORATORY's work on behalf of the CLIENT and to order, at CLIENT's expense, such technical services as may be required.
- 2.3 Designate a person who is authorized to receive copies of LABORATORY's reports.
- 2.4 Undertake the following:
 - (a) Secure and deliver to LABORATORY, without cost to LABORATORY, preliminary representative samples of the equipment proposed to require technical services, together with any relevant data.
 - (b) Furnish such labor and equipment needed by LABORATORY to handle samples at the LABORATORY and to facilitate the specified technical services.

Paragraph 3. GENERAL CONDITIONS:

- 3.1 LABORATORY, by the performance of services covered hereunder, does not in any way assume any of those duties or responsibilities customarily vested in the CLIENT, its employees, or any other party, agency or authority.
- 3.2 LABORATORY shall not be responsible for acts of omissions of any other party or parties involved in the design, manufacture or maintenance of the equipment or the failure of any employee, contractor or subcontractor to undertake any aspect of equipment's design, manufacture or maintenance.
- 3.3 LABORATORY is not authorized to revoke, alter, release, enlarge or release any requirement of the equipment's design, manufacture or maintenance unless specifically authorized by CLIENT or his authorized representative.
- 3.4 THE ONLY WARRANTY MADE BY LABORATORY IN CONNECTION WITH ITS SERVICE PERFORMED HEREUNDER IS THAT IT WILL USE THAT DEGREE OF CARE AND SKILL AS SET FORTH IN PARAGRAPH 1 ABOVE. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE OR INTENDED FOR SERVICES PROVIDED HEREUNDER.
- 3.5 Where the LABORATORY indicates that additional testing is advisable to obtain more valid or useful data, and where such testing has not been authorized, CLIENT agrees to view such test reports as inconclusive and preliminary.
- 3.6 The LABORATORY will supply technical service and prepare a report based solely on the sample submitted to the LABORATORY by the CLIENT. The CLIENT understands that application of the data to other devices is highly speculative and should be applied with extreme caution.
- 3.7 The LABORATORY agrees to exercise ordinary care in receiving, preserving and shipping (F.O.B. Littleton, MA) any sample to be tested, but assumes no responsibility for damages, either direct or consequential, which arise from loss, damage or destruction of the samples due to the act of examination, modification or testing, or technical services or circumstances beyond LABORATORY's control.
- 3.8 The LABORATORY will hold samples for thirty (30) days after tests are completed, or until the CLIENT's outstanding debts to the LABORATORY are satisfied, whichever is later.
- 3.9 The CLIENT recognizes that generally accepted error variances apply and agrees to consider such error variances in its use of test data.
- 3.10 It is agreed between LABORATORY and CLIENT that no distribution of any tests, reports or analysis other than that described below shall be made to any third party without the prior written consent of both parties unless such distribution is mandated by operation of law. It is agreed that tests, reports, or analysis results may be disclosed to third party auditors of the laboratory at the laboratory facility in the course of accreditation maintenance audits. No reference to reports or technical services of the LABORATORY shall be made in any advertising or promotional literature without the express written permission of the LABORATORY.
- 3.11 The CLIENT acknowledges that all employees of LABORATORY operate under employment contracts with the LABORATORY and CLIENT agrees not to solicit employment of such employees or to solicit information related to other clients from said employees.
- 3.12 In recognition of the relative risks and benefits of the project to both CLIENT and LABORATORY, the risks have been allocated such that the CLIENT agrees, to the fullest extent permitted by law, to limit the liability of the LABORATORY to the CLIENT for any and all claims, losses, costs, damages of any nature whatsoever or claims expenses from any cause or causes, including attorneys' fees and costs and expert witness fees and costs, so that the total aggregate liability of the LABORATORY to the CLIENT shall not exceed \$100,000, or the LABORATORY'S total fee for services rendered on this project, whichever is greater. It is intended that this limitation apply to any and all liability or cause of action however alleged or arising, unless otherwise prohibited by law.

Paragraph 4. INSURANCE:

- 4.1 LABORATORY shall secure and maintain throughout the full period of the services provided to the CLIENT adequate insurance to protect it from claims under applicable Workmen's Compensation Acts and also shall maintain one million dollars of general liability coverage to cover claims for bodily injury, death or property damage as may arise from the performance of its services.
- 4.2 The CLIENT hereby warrants that it has sufficient insurance to protect its employees adequately under applicable Workmen's Compensation Acts and for bodily injury, death, or property damage.
- 4.3 No insurance of whatever kind or type, which may be carried by either party is to be considered as in any way limiting any other party's responsibility for damages resulting from their operations or for furnishing work and materials.

Paragraph 5. PAYMENT:

- 5.1 CLIENT shall pay to LABORATORY such fees for services as previously agreed, orally or in writing, within 30 days of presentment of a bill for such services performed. In the event CLIENT ordered, orally or in writing, services but such services were not assigned a rate for billing, such services shall be billed at the LABORATORY's reasonable and customary rate.

- 5.2 CLIENT shall be responsible for all shipping, customs and other expenses related to services provided by LABORATORY to the CLIENT, and shall fully insure any test sample or other equipment provided to LABORATORY by the CLIENT.
- 5.3 Amounts overdue from CLIENT to LABORATORY shall be charged interest at a rate of 1½% per month.

Paragraph 6. ISO/IEC GUIDE 17025 ADDITIONS:

- 6.1 CLIENT agrees that this test report will not be reproduced except in full, without written approval from the LABORATORY.
- 6.2 CLIENT agrees that this test report shall not be used to claim product endorsement by A2LA or ANSI or any agency of the U.S. Government.
- 6.3 CLIENT agrees that test results presented herein relate only to the sample tested by the LABORATORY.

A2LA Accreditation

<u>SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999</u> CURTIS-STRAUS¹ 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880 ELECTRICAL Valid until: July 31, 2005 Certificate Number: 1627-01 In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following <u>Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:</u> Electromagnetic Compatibility (EMC) Radiated emissions testing (electric and magnetic fields); Conducted emissions testing (voltage and current); Electrostatic Discharge testing; Electrical Fast Transient testing; Radiated Immunity testing; Conducted Immunity testing; Lightning Immunity testing; Voltage Dips, Interrupts and Voltage Variations testing; Magnetic Immunity testing; RF Power measurements; Frequency Stability measurements; Longitudinal Induction measurements; Harmonic emissions testing; Light flicker testing; Low frequency disturbance voltage testing; Disturbance Power measurements <table><tr><th>EMC Standards</th><th>Title</th></tr><tr><td>Emissions CISPR 22 1997 with amendments 1 and 2</td><td>Limits and methods of measurement of radio disturbance characteristics of information technology equipment.</td></tr><tr><td>CNS13438 1994</td><td>Limits and methods of measurement of radio interference characteristics of information technology equipment.</td></tr><tr><td>EN55022:1994 and 1998</td><td>Limits and methods of measurement of radio disturbance characteristics of information technology equipment.</td></tr><tr><td>SABS CISPR 22:1997</td><td>Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement</td></tr><tr><td>Canada ICES-003 1997 AS/NZS 3548 1995</td><td>Digital apparatus Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment</td></tr><tr><td>CISPR 11 1990, 1997, 1999</td><td>Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.</td></tr></table> ¹ Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460 (A2LA Cert. No. 1627-01) 10/31/03 Page 1 of 11		EMC Standards	Title	Emissions CISPR 22 1997 with amendments 1 and 2	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.	CNS13438 1994	Limits and methods of measurement of radio interference characteristics of information technology equipment.	EN55022:1994 and 1998	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.	SABS CISPR 22:1997	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement	Canada ICES-003 1997 AS/NZS 3548 1995	Digital apparatus Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment	CISPR 11 1990, 1997, 1999	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.	EN 55011 1991, 1998 characteristics of SABS CISPR 11:1997 Canada ICES-001 1998 CNS13803 AS/NZS 2064: 1997 CSA C108.8 – M1983 CISPR 13:1996, 1998, 2001 EN 55013: 1990, 2001 EN 55013 Amend 12 1994 SABS CISPR 13: 1996 CNS 13439 AS/NZS 1053: 1999 CISPR 14 1993 (except discontinuous disturbances) EN 55014 1993, 1997 (discontinuous disturbances) AS/NZS 1044: 1995 (discontinuous disturbances) Immunity CNS13783-1 SABS CISPR 14-1 1993 SABS CISPR 14-2 1997 + A1:2001 Limits and methods of measurement of radio disturbance industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics Limits and methods of measurement Industrial, scientific and medical radio frequency generators Industrial, Scientific and Medical Instrument Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment. Electromagnetic Emission from Data Processing Equipment and Electronic Office Machines Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. Sound and television broadcast receivers and associated equipment: Electromagnetic compatibility. Part 1: Specification for limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment. Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment. Amendment 12 Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. Broadcast receiver and associated equipment Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and electric apparatus. Limits and methods of measurement of radio disturbance (except characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus). Limits and methods of measurement of radio disturbance (except characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus). Household Electrical Appliances Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 1: Emission – Product family standard Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity – Product family standard (A2LA Cert. No. 1627-01) 10/31/03 Page 2 of 11
EMC Standards	Title															
Emissions CISPR 22 1997 with amendments 1 and 2	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.															
CNS13438 1994	Limits and methods of measurement of radio interference characteristics of information technology equipment.															
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Canada ICES-003 1997 AS/NZS 3548 1995	Digital apparatus Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment															
CISPR 11 1990, 1997, 1999	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.															
CISPR 14-2 1996, 1997 + A1:2001 CISPR 20: 1995, 2002 with amendment 3 (associated group only) EN 55020: 1995, 2002 (associated group only) CISPR 24 SABS CISPR 24 1997 AS/NZS 3200.1.2: 1995 European Union Basic EMC Standards EN 61000-4-2: 1995, 1999, 2001 EN 61000-4-3:1997, 1998, 2002 AS/NZS 61000.4.3 1999 EN 61000-4-4 1995 EN 61000-4-5 1995 AS/NZS 61000.4.5 1999 EN 61000-4-6 1996 AS/NZS 61000.4.6 1999 EN 61000-4-8 1994 EN 61000-4-11 1994 ENV 61000-2-2 1993 EU Product Family Standards EN 50081-1 1992 EN 50081-2 1993 EN 50082-1 1992, 1998 EN 50082-2 1995 Immunity requirements for household appliances, tools and similar apparatus. Limits and methods of measurement of immunity characteristics of sound and television broadcast receivers and associated equipment. Electromagnetic immunity of broadcast receivers and Associated equipment. Information technology equipment – Immunity characteristics – Limits and methods of measurement Information technology equipment – Immunity characteristics – Limits and methods of measurement Approval and test specification – Medical electrical Equipment – General requirements for safety – Collateral Standard: Electromagnetic compatibility – Requirements and tests. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test – Basic EMC Publication Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 3: Radiated, radio-frequency, electromagnetic field immunity test Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test – Basic EMC publication (EMC) Part 4: Testing and measurement techniques. Section 5: Surge immunity test. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances, induce by radio-frequency fields. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test. (EMC) Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage Variations immunity tests. Electromagnetic compatibility (EMC). Part 2: Environment, Section 2: Compatibility levels for low-frequency conducted disturbances and signaling in public low-voltage power supply systems (IEC 1000-2-2:1990) Electromagnetic capability – Generic emission standard. Part 1: Residential, commercial and light industry. (I.S.) Electromagnetic compatibility – Generic emission standard. Part 2: Industrial environment Electromagnetic compatibility – Generic emission standard. Part 1: Residential, commercial and light industry Electromagnetic compatibility – Generic immunity Standard. Part 2: Industrial environment (A2LA Cert. No. 1627-01) 10/31/03 Page 3 of 11	EN 61000-6-1: 1997, 2001 EN 61000-6-2: 1998, 2001 EN 50091-2 1996 EN 55024 1998 EN 55103-1 1997 EN 55103-2 1997 (excluding Annex A3) EN 61326 1998 EN 61547 1996 EN 50130-4 1996 EN 55104 1995 EN 50083-2 1995 EN 60601-1-2: 1993, 2002 IEC 1800-3 1995 EN 60555 Part 2 1987 EN 60555 Part 3 1987 EN 61000-3-2: 1995, 2000 AS/NZS 61000.3.2 1998 EN 61000-3-3 1995 AS/NZS 61000.3.3 1999 ETS 300 386-1 1994 Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 1: Immunity for residential, commercial and light-industrial environments Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 2: Immunity for industrial environments Specification for Uninterruptible Power Systems (UPS). Part 2: EMC requirements Information technology equipment – Immunity Characteristics – Limits and methods of measurement. Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1: Emission Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control professional use. Part 2: Immunity Electrical equipment for measurement, control and laboratory use – EMC requirements Equipment for general lighting purposes – EMC immunity requirements Alarm Systems. Part 4: Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems. Electromagnetic compatibility immunity – requirements for household appliances, tools and similar apparatus. Product family standard. Cabled distribution systems for television and sound signals. Part 2: Electromagnetic compatibility for equipment. Medical electrical equipment Part 1: general requirements for safety Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods. Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 2: Harmonics Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 3: Voltage fluctuations. Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limits for harmonic current emissions Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limitation of voltage fluctuations and flicker in low-voltage supply systems. Equipment Engineering (EE); Public telecommunication network equipment electro-magnetic compatibility (EMC) requirements Part 1: Product family overview, compliance criteria and test levels (A2LA Cert. 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ETS EN 300 386-2 1997, 1998, ETS EN 300 386 2000 v1.2.1, 2001 v1.3.1 ETS 300 132-1 1996 ETS 300 132-2 1996 ETR 283 1997 <i>EU radio standards</i> (ETS) EN 300 385 v1.2.1: 1998, 1999 EN 300 330 v1.2.1: 1998, 1999 ETS 300 328 1996 ETS EN 300 440 v1.2.1 1999 EN 301 893:2002 v1.2.1 ETS 300 836-1:1998 EN301 489-17:2002 v1.2.1	Electromagnetic compatibility and radio spectrum matters (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements; Part 2: Product family standard. Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (ac) derived from direct current (dc) sources Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc) Equipment Engineering (EE): Transient voltages at Interface A on telecommunications direct current (DC) power distributions. Electromagnetic compatibility and Radio spectrum matters (ERM); Electromagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment (ETS) Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices (SRD); Technical characteristics and test methods for radio equipment in the range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz Radio Equipment and Systems (RES); Wideband transmission systems; Technical characteristics and test conditions for data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation techniques Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 1 GHz to 40 GHz frequency range Broadband Radio Access Networks (BRAN); 5 GHz (draft) high performance RLAN; Harmonized EN covering Essential requirements of article 3.2 of the R&TTE Directive Broadband Radio Access Networks (BRAN); High Performance Radio Local Area Network (HIPERLAN) Type 1; Conformance testing specification; Part 1: Radio Type approval and Radio Frequency (RF) conformance test specification Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2.4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment	EN 300 328-2:2001 v1.2.1 EN 301 489-1:2002 EN 60669-2-1:2002 <i>Canada Radio Standards</i> Canadian GL-36 1995 Canadian RSS-119 1999, 2000 Issue 6 Canadian RSS-134 1996 & 2000, Issue 1 Rev 1 Canadian RSS-210 2000 Issue 3, RFS29 1998 Specification for Restricted Radiation Radio Apparatus (New Zealand) <i>FCC Standards</i> 47 CFR FCC low power transmitters operating on frequencies below 1 GHz, emergency alert systems, unintentional radiators and ISM devices. 47 CFR FCC low power transmitters operating on frequencies above 1 GHz, with the exception of spread spectrum devices. 47 CFR FCC Unlicensed Personal Scope Communications System (PCS) devices 47 CFR FCC Unlicensed National Scope Information Infrastructure devices and low power transmitters using spread spectrum techniques. 47 CFR FCC Personal mobile Scope Radio Services in the following FCC Rule Parts 22, 24, 25, 27. 47 CFR FCC General Mobile Radio Scope Services in the following FCC Rule Parts 22, 74, 90, 95, 97. 47 CFR FCC Maritime and Aviation Scope Radio Services in 47 CFR Parts 80 and 87 47 CFR FCC Microwave Radio Services Scope in 47 CFR Parts 21, 74 and 101.	
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FCC/OST MP-5 1986 GR-1089-CORE: 1997, 1999 issue 2/ 2002 Issue 3 <i>ANSI EMC Standards</i> ANSI C63.4: 1992, 1999, 2001 ANSI C63.5 1988 <i>IEEE EMC Standards</i> IEEE C62.41: 1980, 1991 <i>Swedish EMC Standards</i> BAKOM 3336.3 1995 <i>South African EMC standards other than CISPR equivalents</i> SABS 1718-1: 1996 <i>Japanese VCCI Standards</i> VCCI V-3/99.05 1999 VCCI V-4/99.05 1999 Telecommunications Telecommunications Registration; General test methods; Lightning surge; Drop testing; Balance testing; Signal power (metallic and longitudinal); Frequency measurements; Pulse templates; Leakage testing; Impedance testing; Hearing Aid Compatibility testing (<i>excluding volume control</i>); Protocol analysis and Jitter testing. <u>Telecom Standards</u>	FCC (Federal Communications Commission) methods Of measurement of radio noise emissions from industrial, scientific and medical equipment. Bellcore electromagnetic compatibility and electrical safety -- Generic criteria for network telecommunications equipment. American National Standard for methods of measurement of radio-noise emissions for low-voltage electrical and electronic equipment in the range of 9 kHz to 40GHz. American National Standard for electromagnetic compatibility -- radiated emissions measurements in electromagnetic interference (EMI) control -- calibration of antennas. IEEE recommended practice on surge voltages in low-voltage AC power circuits Electromagnetic compatibility and electrical safety (EMC & S) for wired terminal equipment. Harmonization document information over the OFCOM requirements. South African Bureau of Standards: Specification for Gaming equipment. Part 1: Casino equipment. Technical Requirements Instruction for Test Conditions for Requirement under Test	TIA/EIA-IS-968 TIA/EIA-IS-883 TIA-968-A T1.TRQ 6-2001 Canada VDSL Issue 1 January 2003 AS/ACIF S002-2001 AS/ACIF S016-2001 AS/ACIF S031-2001 AS/ACIF S038-2001 AS/ACIF S043-2001 ITU-T G.703 HKTA 2028 HKTA 2029 TBR 1 : 1995 TBR 2 : 1997 Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network Telecommunications Telephone Terminal Equipment Supplemental Technical Requirements for Connection of Stutter Dial Tone Detection Devices and ADSL Modems to the Telephone Network Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network Technical Requirements for SHDSL, HDSL2, HDSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Telephone Network Industry Terminal Attachment Program Requirements and Test Methods for Very-High-Bit-Rate Digital Subscriber Line (VDSL) Terminal Equipment Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network Requirements for Customer Equipment for connection to hierarchical digital interfaces Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access Interface Requirements for Customer Equipment for Connection to a Metallic Local Loop Interface of a Telecommunications Network -- Part 1: General Part 2: Broadband Part 3: DC, Low Frequency AC and Voiceband Physical/electrical characteristics of hierarchical Digital interfaces Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s Attachment requirements for terminal equipment to be connected to circuit switched data networks and leased circuits using a CCITT Recommendation X.21 interface, or at an interface physically, functionally and electrically compatible with CCITT Recommendation X.21 but operating at any data signaling rate up to, and including, 1 984 kbit/s Attachment requirements for Data Terminal Equipment (DTE) to connect to Packet Switched Public Data Networks (PSPDNs) for CCITT Recommendation X.25 interfaces at data signaling rates up to 1 920 kbit/s utilizing interfaces derived from CCITT Recommendations X.21 and X.21 bit	
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TBR 3 : 1995 + Amdt : 1997 TBR 4 : 1995 + Amdt : 1997 TBR 012 : 1993 + Amdt : 1996 TBR 013 : 1996 TBR 21 : 1998 TBR 24 : 1997 <i>Australia</i> TS 002 : 1997 TS 016 : 1997 TS 031 : 1997 TS 038 : 1997 AS/ACIF S043.2:2001 Product Safety General test methods; Input tests; Electric strength tests; Impulse tests; Permanency of marking tests; Accessibility tests; Energy Hazard measurements; Capacitor discharge tests; Humidity conditioning; Earthing tests; Limited power source measurements; Stability tests; Steel ball tests; Lithium Battery Reverse Current measurements; Leakage current tests; Transformer abnormal tests; Telecom leakage tests; Over voltage/power cross tests (<i>excluding x-ray tests</i>). <u>Product Safety Standards</u> Specific Product Safety Standards IEC 950 1991 UL 1950 1998 CSA C22.2 No.950-95 UL 60950 2000 (A2LA Cert. No. 1627-01) 10/31/03	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment Business Telecommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface Terminal Equipment (TE); Attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signaling Business Telecommunications (BTC); 34 Mbit/s digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for terminal equipment interface Analogue Interworking and Non interference Requirements for Customer Equipment Connected to the Public Switched Telephone Network General Requirements for Customer Equipment Connected to Hierarchical Digital Interfaces Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access Interface Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network – Part 2 Broadband Title Safety of information technology equipment including Amendments 1, 2, 3, and 4 electrical business equipment. Safety of information technology equipment, including electrical business equipment. Safety of Information Technology Equipment (UL 1950) Safety of information technology equipment	IEC 60950 2000 EN 60950 1997, 1998, 2000 IEC 60950-1 2001 UL 60950-1 2003 CSA C22.2 No. 60950-00 CSA C22.2 No. 60950-1 03 AS/NZS 3260 1993 AS/NZS 3260 Supp 1 1996 ACA TS 001 1997 UL 1459 1995 IEC 1010-1 1990 IEC 61010-1 1993 EN 61010-1 1993, 2001 IEC 61010-1 2001 UL 61010B-1 2003 UL 3101-1 1993 CAN/CSA 1010-1 1999 (<i>Including AM 2</i>) UL 3111-1 1996 UL 3121-1 1995 IEC 60601-1 1995 EN 60601-1 1995 (<i>Including AM 2</i>) UL 2601-1 1997 IEC 60065 1998, 2000 ANSI/UL 6500: 1998 CAN/CSA 60065-00 AS/NZS 3250 1995 AS/NZS 60065 2000 Canadian C22.2 No. 1-94 (1-98) 1998 EN 60065 1994 IEC 60825 1990 EN 60825-1 1994 IEC 60825-1 2001 IEC 60825-2 2000-5 systems IEC 60825-4 1997-11 IEC 60335-1 1995 (<i>Including AM2 – 1997 & AM 12 – 1997</i>) EN 60335-1 2001 UL 60335-1 1998 CAN/CSA E335-1 1994	Safety of information technology equipment Safety of information technology equipment, including Electrical business equipment. Approval and test specification – Safety of information technology equipment including electrical business Equipment. Approval and test specification – Safety of information technology equipment including electrical business equipment – Alphabetical reference index to IEC 950 (Supplement to AS/NZS 3260:1993) Australian Communications Authority – Safety requirements for customer equipment. Telephone Equipment Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements. Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements. Electrical equipment for laboratory use Part 1: General requirements. Electrical measuring and test equipment. Part 1: General requirements. Medical electrical equipment. Part 1: General requirements for safety. Medical electrical equipment Medical electrical equipment. Part 1: General Requirements for safety. Audio, video and similar electronic apparatus – Safety requirements Audio/video and musical instrument apparatus for Household, commercial and similar general use Australian/New Zealand Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use Audio, video and similar electronic equipment. Consumer and 1994, commercial products Safety requirements for main operated electronic and related apparatus for household and similar general use. Radiation safety of laser products, equipment Classification, requirements and user's guide Safety of laser products Part 1: equipment Classification, requirements and user's guide. Safety of laser products – Part 2: Safety of optical communication Safety of laser products – Part 4: Laser guards Safety of household and similar electrical appliances Part 1: General requirements
UL 61010A-1 : 2002 EN 61010-1 : 2001 AS/NZS 60950 : 2000 Environmental² <u>Environmental Standards</u> GR-63-CORE ETS 300 019 (vibration up to 1000Hz)	Electrical equipment for laboratory use; part 1: General requirements Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements Safety information technology equipment Title NEBS Requirements: Physical Protection Environmental conditions and environmental tests For telecommunications equipment		(A2LA Cert. No. 1627-01) 10/31/03

² Environmental testing is performed at the satellite facility located at 168 Ayer Rd, Littleton, MA 01460